through the whole winter; for if each female furnishes only one egg there are an immense number of females. The egg hatched on the 11th May [March?]; and I placed the little *Aphis* which issued from it, and which is, of course, the larva of the foundress-form, upon a small poplar, which I planted on purpose in my garden. Now, on the 3rd April, I have the satisfaction of seeing my little artisans at work, burying themselves in the tender stalks of the first buds, and beginning to disappear beneath a little elevation which surrounds them like a halo, of a bright carmine tinge.

I had wished to be able to give the complete history of the biological cycle of this *Aphis*; but I hope that what I have seen may facilitate the study of these interesting metamorphoses by other observers. However, the theories which I have already had the honour of presenting to the Academy with regard to *Phylloxera* and other species of Pemphigians are here again fully confirmed: there are four larval forms preceding the sexual forms; and of these four forms two are apterous and two winged.—*Comptes Rendus*, April 5, 1880, p. 804.

Structure of the Eye of Limulus.

By A. S. Packard, Jun.

The eyes of the horseshoe or king crab are four in number, consisting of a pair of compound eyes situated on the side of the head, and a pair of small simple eyes on the front of the head. As described by A. Milne-Edwards and Owen, the optic nerves to these eyes are very long and slender. Those distributed to the larger compound eyes are very long, and close to each eye subdivide into an irregular plexus of fine nerves, a branch being, as we have found, distributed to each facet composing the compound eye. The structure of the eye is very unlike that of any other Arthropod eye. The cornea is simply a smooth convex portion of the integument, which is much thinner than the adjoining part of the chitinous skin. There are no facets, the cornea externally being structureless, simply laminated like the rest of the integument. In the internal side of the cornea are a series of solid chitinous conical bodies, separated from one another by a slight interspace and in form resembling so many minié-rifle balls; the conical ends of these solid cones project free into the interior of the body, and are enveloped in a dense layer of black pigment. Within the base of these cones are secondary, shallow, cup-like bodies or shallow secondary cones. It is these primary cones which, seen through the smooth, convex, translucent cornea, give the appearance of a faceted surface to the external eye.

All the parts thus far described, except the pigment layer, are moulted with the rest of the crust; and the large, long, slender cones can be easily seen by viewing a piece of the cast-off eye, the solid cones being seen projecting from the inner surface of the cast-off cornea.

The internal structure of the eye is very simple. *There are no cones and no rods*; but a branch of the optic nerve impinges directly

upon the end of the solid chitinous cone, as determined by removing the layer of pigment with dilute potash, and treating the section with acetic acid and then staining with picro-carmine. So far as we can ascertain, no Arthropod eye is so simple as that of *Limulus*. Our observations have been based on a study of the structure of the lobster's eye from preparations of very great beauty and delicacy, kindly made for us by Norman N. Mason, Esq., of Providence, who has also made beautiful sections of the *Limulus*-eye, after treating them in various ways. The question as to the nature of the solid cones we are not yet prepared to settle. Are they crystalline lenses or only analogous organs? Can the horseshoe crab distinguish objects? We doubt if its eyes enable it to more than distinguish between the light and darkness. Since the above remarks were put in type, we have seen Grenacher's great work on the eyes of Arthropoda. He regards the conical chitinous minié-ball-like bodies as corneal lenses. He does not describe the simple eye, which is a close repetition of one of the corneal lenses of the compound eye of the same animal, except that the lens is shorter and with the end much more obtuse.—*American Naturalist*, March 1880.

Fossil Crawfish from the Tertiaries of Wyoming.

By A. S. Packard, Jun.

Two specimens of fossil crawfish quite well preserved have been kindly lent us for description by Professor Leidy, who received them from the fish-beds of the western border of Wyoming, through Dr. J. Van A. Carter, of Evanston, Wyoming. Of the two specimens the smaller presents a dorsal, and the larger a lateral view, both being slightly distorted by pressure; the length of the smaller from the tip of the rostrum to the end of the telson is 38 millims., and of the larger 53 millims. They do not differ generically from existing species of *Cambarus*, though with some resemblances to *Astacus*; but as the gills are not represented it is not possible to say to which of these two genera the species belongs; still the weight of characters ally it nearest to *Cambarus affinis*, as seen in the long, narrow, pointed rostrum, and the form of the chelæ and the second antennal scales. These scales are also much as in *C. obesus*, var. *latimanus* and *Bartonii*, but rather narrower, the lateral terminal spine being long, slender, acute. The flagella of the second antennæ are of the usual size, extending to the terminal fourth of the abdomen. The distal end of the scape of the first antennæ reaches to near the end of the last joint of the scape of the first pair, the species in this respect being more like *Cambarus* than *Astacus*. The carapace is of the proportions of living species of *Cambarus*. The first pair of legs are rather shorter and stouter than in our living crawfishes, and the chelæ are rather shorter; while the surface of the carapace and legs is much more coarsely tuberculated than in our *Cambari*, and in this respect resembles large specimens of *Astacus fluviatilis* of Europe, though the tubercles are larger.